



ELECTRONIC TUBE REFERENCE

1AF34

Voltage - Pentode or Tetrode (under 100V) electronic tube

CONSOLIDATED TECHNICAL DATA

2 SECTIONS

CONSTRUCTION

DIODE-PENTODE

Directly heated battery diode-pentode combining radio signal detection with subsequent low-frequency voltage amplification. The diode recovers the received signal while the pentode provides AF gain in economical portable receivers.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
NOMINAL HEATER	1.4 V / 30 mA	PARALLEL HEATER	— / —
HEATING	Direct	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Dissimilar

SECTION RATINGS

SECTION1 Diode	
MAXIMUM PLATE VOLTAGE	50 V
MAXIMUM CATHODE CURRENT	0.2 mA
<i>Published ratings and characteristics promoted from the approved source.</i>	

SECTION2 Pentode	
TRANSCONDUCTANCE	0.0003 S
MAXIMUM PLATE VOLTAGE	90 V
MAXIMUM SCREEN VOLTAGE	90 V
MAXIMUM PLATE DISSIPATION	0.15 W
MAXIMUM SCREEN DISSIPATION	0.05 W
MAXIMUM CATHODE CURRENT	2.5 mA
<i>Published ratings and characteristics promoted from the approved source.</i>	

1AF34 — Diode-Pentode Vacuum Tube

A directly heated, subminiature or miniature diode-pentode vacuum tube designed for low-power audio-frequency amplification and amplitude modulation (AM) demodulation.

Overview

The **1AF34** is a multi-unit vacuum tube containing a single diode and an audio-frequency (AF) pentode within a single envelope. It is designed primarily for battery-operated or low-power portable equipment, combining the functions of an AM demodulator (detector) and an AF voltage amplifier. The tube features a directly heated filament designed for low current consumption, operating at a nominal filament voltage of **1.2 V** with a current draw of only **30 mA**.

Physical Characteristics and Pinout

The 1AF34 is constructed in a compact glass envelope with a maximum diameter of **19 mm** and a maximum overall length of **49 mm**. It utilizes a standard **7-pin base** configuration. The filament negative terminal is internally tied to the suppressor grid (Grid 3), which simplifies external wiring by automatically referencing the suppressor grid to the negative side of the filament.

The pin connections, viewed from the bottom of the tube, are assigned as follows:

Pin Number	Electrode Connection
Pin 1	Filament negative ($-f$), Grid 3 ($g3$)
Pin 2	Grid 1 ($g1$)
Pin 3	Diode (d)
Pin 4	Grid 2 ($g2$, Screen Grid)
Pin 5	Anode (a , Plate)
Pin 7	Filament positive ($+f$)

(Note: Pin 6 is not connected internally.)

Interelectrode Capacitances

The interelectrode capacitances of the 1AF34 are specified to ensure stable operation in high-impedance audio and detector circuits. The capacitance values are as follows:

- **Grid 1 Capacitance (C_{g1}):** 2.4 pF
- **Anode Capacitance (C_a):** 4.6 pF
- **Anode to Grid 1 Capacitance ($C_{a/g1}$):** < 0.3 pF
- **Diode to Filament Capacitance ($C_{d/f}$):** 1.5 pF

The low anode-to-grid capacitance ($C_{a/g1} < 0.3 \text{ pF}$) minimizes Miller effect feedback, which is critical for maintaining high input impedance and stable gain in high-resistance pentode amplifier stages.

Operational Data and Circuit Applications

The pentode section of the 1AF34 can be operated either in a standard pentode configuration or triode-connected to suit different voltage gain and distortion requirements.

AF Resistance-Coupled Amplifier (Pentode Connection)

In pentode operation, the tube delivers high voltage gain at very low operating currents. Typical operating conditions are specified for three supply voltages (U_b) using a fixed anode load resistor (R_a) of **1 MΩ** and a screen grid resistor ($R_{[g2]}(/tubes/G2)$) of **3.3 MΩ**:

Parameter	Condition A	Condition B	Condition C
Supply Voltage (U_b)	45 V	67.5 V	90 V
Anode Resistor (R_a)	1 MΩ	1 MΩ	1 MΩ
Screen Grid Resistor ($R_{[g2]}(/tubes/G2)$)	3.3 MΩ	3.3 MΩ	3.3 MΩ
Grid Resistor (R_{g1})	10 MΩ	10 MΩ	10 MΩ
Following Stage Grid Resistor ($R_{g1'}$)	2.2 MΩ	2.2 MΩ	2.2 MΩ
Operating Current (I_b)	0.05 mA	0.075 mA	0.1 mA
Voltage Gain (U_o/U_i)	45	60	67
Total Harmonic Distortion (k)	2%	3%	5%
Output Voltage ($U_{o \text{ eff}}$)	5 V	5 V	5 V

These operating points demonstrate that as the supply voltage increases from 45 V to 90 V, the voltage gain increases from 45 to 67, while the operating current remains extremely low (not exceeding 0.1 mA). This makes the pentode section highly efficient for battery-powered designs.

AF Resistance-Coupled Amplifier (Triode Connection)

For applications requiring lower distortion and lower output impedance, the pentode section can be operated in a triode configuration. Typical operating points are specified at a supply voltage (U_b) of **90 V**:

Parameter	Condition D	Condition E
Supply Voltage (U_b)	90 V	90 V
Anode Resistor (R_a)	0.22 M\2126	0.47 M\2126
Grid Resistor (R_{g1})	10 M\2126	10 M\2126
Following Stage Grid Resistor ($R_{g1'}$)	0.68 M\2126	1.5 M\2126
Operating Current (I_b)	0.25 mA	0.13 mA
Voltage Gain (U_o/U_i)	11	11.6
Total Harmonic Distortion (k)	1%	0.8%
Output Voltage (U_o)	5 V	5 V

In triode connection, the voltage gain is reduced to approximately 11 to 11.6, but the total harmonic distortion is significantly lower (0.8% to 1%) compared to the pentode connection at the same output voltage level.

Maximum Ratings

To ensure reliable operation and prevent premature failure, the operating parameters of the 1AF34 must be kept within the specified maximum limits.

Pentode Section Ratings

The pentode section is rated for low-voltage operation, reflecting its optimization for portable battery-operated equipment:

- **Cold Anode Voltage (U_{ao}):** Max 250 V (maximum voltage when the tube is cold and not conducting)
- **Anode Voltage (U_a):** Max 90 V
- **Cold Screen Grid Voltage (U_{g2o}):** Max 250 V
- **Screen Grid Voltage ($U_{[g2]}(/tubes/G2)$):** Max 67.5 V
- **Grid 1 Voltage (U_{g1}):** Max 0 V
- **Cathode Current (I_k):** Max 4.5 mA
- **Grid 1 Resistor (R_{g1}):**
 - Standard bias: Max 3 M\2126
 - Grid leak bias: Max 22 M\2126 (applicable only when the operating bias U_{g1} is entirely produced by the grid leak current through R_{g1})
- **Filament Voltage (U_f):** Max 1.4 V / Min > 0.9 V

Diode Section Ratings

The independent diode section is designed for signal detection and AM demodulation, with the following maximum limits:

- **Peak Diode Voltage ($U_{d\text{ sp}}$):** Max 50 V
- **Diode Current (I_d):** Max 0.2 mA
- **Peak Diode Current ($I_{d\text{ sp}}$):** Max 1.2 mA

Technical Summary

The **1AF34** is a specialized, directly heated **diode-pentode** designed for low-power receiving applications. Operating with a highly efficient **1.2 V, 30 mA** filament, it integrates an AM demodulator diode and a high-gain AF pentode in a single **7-pin** envelope. The pentode section is capable of providing a voltage gain of up to **67** in pentode connection, or operating with low distortion (down to **0.8%**) in triode connection. With its strict maximum anode voltage rating of **90 V** and low current consumption, the 1AF34 is optimized for battery-operated portable receivers and compact audio preamplifier stages.

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